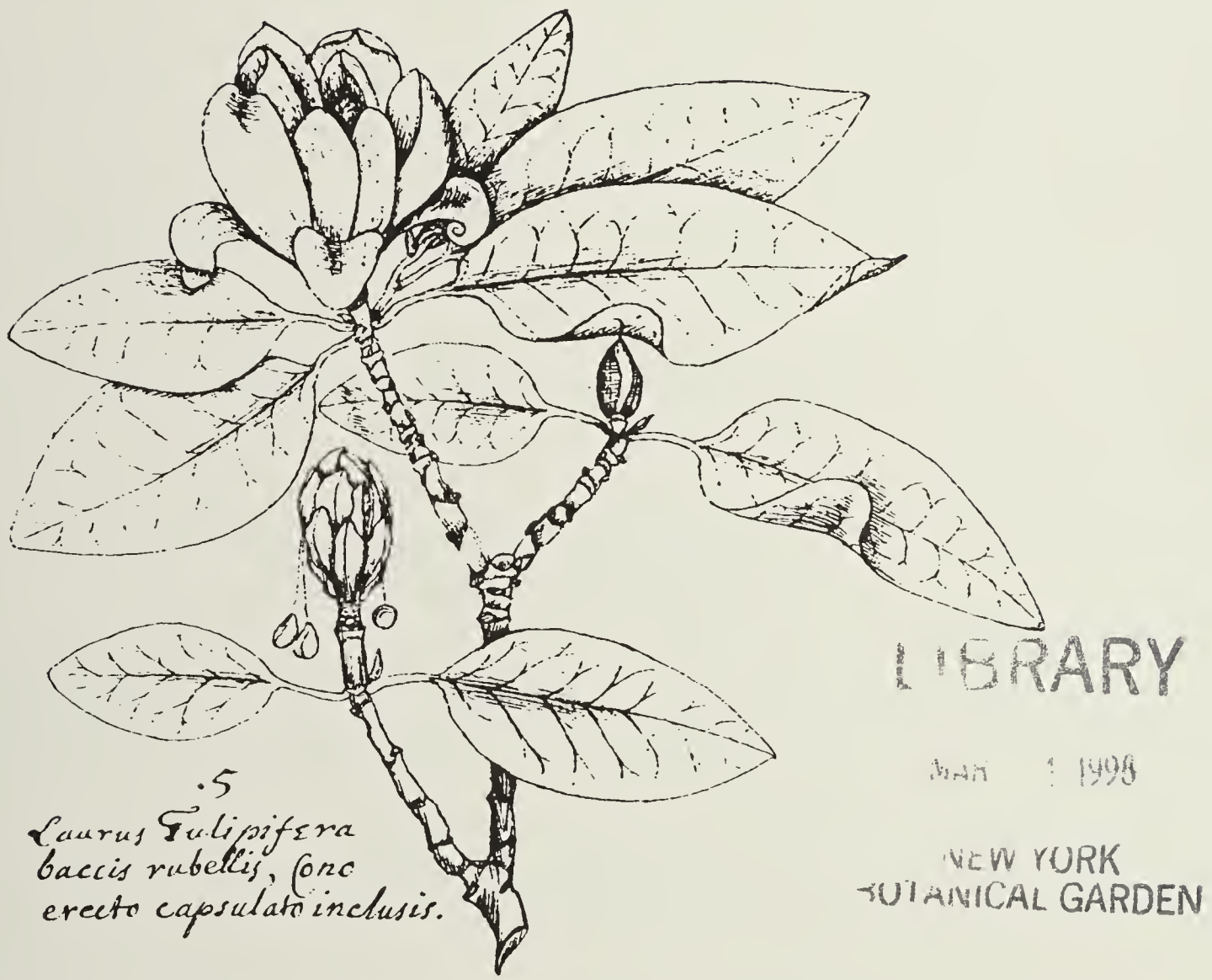
BANISTERIA

A JOURNAL DEVOTED TO THE NATURAL HISTORY OF VIRGINIA



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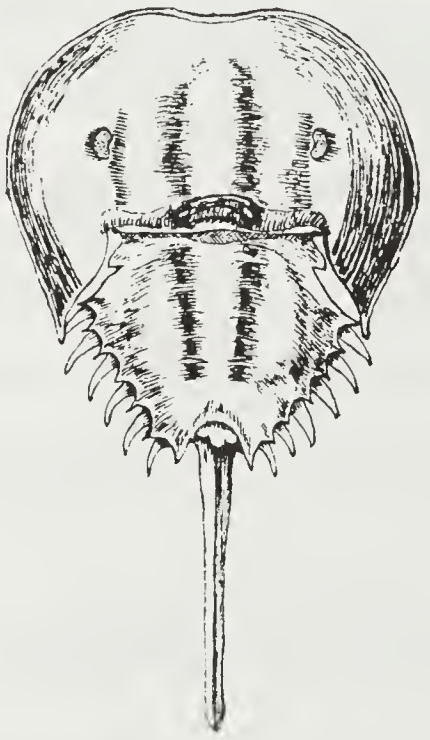

Banisteria, Number 2, 1993

Classification and Ecological Interpretation of Mafic Glade Vegetation on Buffalo Mountain, Floyd County, Virginia

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Buffalo Mountain is a monadnock which rises abruptly above the hilly terrain of the Blue Ridge upland in Floyd County, Virginia (Dietrich, 1970). Maximum elevation is 1210 m (3971 feet), and according to the Geologic Map of Virginia (Calver, 1963), the bedrock is the Lynchburg Formation. More recent geologic investigations determined the bedrock to be amphibole gneiss, a metamorphosed volcanic rock of the Alligator Back Formation in the Lynchburg Group of the Blue Ridge Anticlinorium (W. S. Henika, personal communication).

Buffalo Mountain has for years attracted the attention of botanists whose sporadic visits were concentrated largely around the open summit and rich, north slope forests. The first comprehensive floristic inventory of the mountain was conducted as a class project by Virginia Polytechnic Institute and State University undergraduate students, under the direction of Duncan M. Porter. Their unpublished report listed 272 species of vascular plants, and referred to the grassy summit and south slope as a naturally treeless bald which was probably maintained by shallow soil, fast runoff of rainwater, and exposure to the afternoon sun (Porter, 1975). Recognizing that this type of vegetation could be a very significant natural heritage resource, we located all such openings on an aerial photograph and conducted a brief but intensive vegetation study. We decided that the colloquial term, glade, was a better descriptor for the openings because they were not restricted to the summit, and were most often associated with bedrock outcrops. The purpose of this paper is to classify, describe, and better understand this glade vegetation in relation to environmental conditions. A secondary goal is to document the community and habitat relations of the rare plant species which inhabit the glades.

Materials and Methods

Five 10 m x 10 m plots of representative glade vegetation were sampled on August 22 and September 13, 1991. Plots were situated along the slope gradient from the summit to the lowest glade on the south slope. We recorded aspect, slope, topographic position, elevation, surface substrate, the cover-abundance class of each vascular plant species in the plot, and noted species present immediately outside the plot in similar vegetation. Floristic data were analyzed using Braun-Blanquet tabular methods (Westhoff and Maarel, 1973) to generate provisional community-types. Relationships between this new classification and prior classifications of similar vegetation were examined. Site factors and edaphic conditions were evaluated to help determine synecological relationships among the community-types. Nomenclature of vascular plants follows Harvill et al. (1992).

Results and Discussion

The glades change markedly in their floristic composition from the summit to the lower mid-slope, and thus represent an extensive and nearly continuous vegetation gradient. Environmental factors which appear to have

Table 1. Environmental data and general vegetation characteristics of Buffalo Mountain glades.

Plot Number	1	2	3	4	5
Aspect/Slope (%)	S/16-30	NW/75+	SW/8-16	S/30-65	SE/30-65
Topographic Position	crest	upper	upper	upper-mid	lower-mid
Elevation (meters)	1189	1189	1176	1128	1036
Surface Bedrock (%)	85	50	-	7	10
Surface Boulders (%)	-	-	2	2	2
Surface Gravel (%)	15	-	1	3	1
Surface Mineral Soil (%)	-	50	97	88	87
Vegetation Physiognomy	herbaceous	thicket	shrubland	shrubland	shrubland
No. of Vascular Plant Species	8	36	34	39	63

the greatest influence on the nature of the vegetation are topographic position, elevation, and the amount of surface mineral soil (Tables 1 & 2). The glade vegetation was classified using three hierarchical levels: alliance, association, and subassociation (Table 2). Within this hierarchical structure, each community-type was named using three characteristic or diagnostic plant species. The rectangles, or boxes, within Table 2 represent differential-species of the community-types, and to a certain extent, portray a community gradient which extends from the summit downslope to the lowest glade, encompassing a 153 m (492 feet) elevation change (Table 1). The communities generally have distinct boundaries recognized in the field by aggregations of the differential-species.

The *Sorbus americana-Kalmia latifolia/Saxifraga michauxii* Alliance is a prevalent type of oligotrophic vegetation found on exposed, high elevation summits in the southern Appalachian region. Similar, if not identical, vegetation has been described as heath bald communities in North Carolina (Tucker, 1972; Schafale & Weakley, 1990). This alliance is alpestrine in character and occurs on several different bedrock types in Virginia including Catoctin greenstone at Hawksbill and Stony Man Mountains and Pedlar granite at Spy Rock (G. P. Fleming, unpublished data). On Buffalo Mountain the alliance is represented by the two associations described below.

The *Paronychia argyrocoma-Potentilla tridentata-Arenaria groenlandica* Association is a type of lithophytic vegetation which occupies bedrock crevices and shallow accumulations of disintegrated rock and soil material amid lichen and moss covered bedrock outcrops near the summit. In this association *Paronychia argyrocoma* forms distinct "cushions", an adaptation well suited to the rigors of an exposed montane environment (Figure 1).

The *Hamamelis virginiana-Rhododendron catawbiense-Physocarpus opulifolius* Association occurs as a dense thicket along the upper northwestern slope and in sheltered rocky hollows where deeper soils exist. Woody species typically show twisted, flagged, or wind-sculptured growth form resulting from severe exposure. Mesophytic forbs such as *Aster umbellatus*, *Dennstaedtia punctilobula*, and *Maianthemum canadense* are characteristic of the herb layer.

The *Andropogon gerardii-Liatris graminifolia-Senecio pauperculus* Alliance is a rare type of "mafic" glade vegetation characterized by the magnesium loving/tolerant plants *Senecio pauperculus*, *Lilium grayi*, *Castilleja coccinea*, *Solidago rigida*, *Physocarpus opulifolius*, and *Polygonum tenue* (T. J. Rawinski, unpublished data). The term mafic is a mnemonic adjective derived from *ma*gnesium and *ferr*ic, and is used to describe rocks composed chiefly of dark-colored ferromagnesian minerals (Radford et al., 1981). The Glades region of Grayson County is the only other Virginia site known to support this alliance. Soils there have an average calcium:magnesium ratio of 0.37 (T. J. Rawinski, unpublished data), comparable in this respect to serpentine soils (Kruckeberg, 1967; Walker, 1954). The soils at Buffalo Mountain have not yet been chemically analyzed, but we suspect similarly low calcium:magnesium ratios. The alliance occurs on the south side of Buffalo Mountain and includes the two well-defined associations described below.

The *Salix occidentalis-Helianthemum bicknellii-Aletris farinosa* Association is an extremely rare community-type which appears to be endemic to the upper southern slope of Buffalo Mountain. It occurs on mineral soils and has a grassland or shrubland physiognomy (Figure 2). Nutrient regime is oligotrophic, judging by the knee-high

Plot Number	1	2	3	4	5
SORBUS AMERICANA-KALMIA LATIFOLIA/SAXIFRAGA MICHAUXII ALLIANCE					
Sorbus americana (SL)		2+	p		
Kalmia latifolia (H/SL)	+/	/2-	/p		
Saxifraga michauxii	1-	+			
Solidago randii *	p	+	+		
Gaylussacia baccata (H/SL)	p/	/1-			
Paronychia argyrocoma-Potentilla tridentata-Arenaria groenlandica Association					
Paronychia argyrocoma	2-	+			
Potentilla tridentata *	1-	+	1+		
Arenaria groenlandica *	+	+			
Hamamelis virginiana-Rhododendron catawbiense-Physocarpus opulifolius Association					
Hamamelis virginiana (SL)		2-			
Rhododendron catawbiense (SL)		1-			
Physocarpus opulifolius (H/SL)		/p		/p	+/+
Aronia prunifolia (SL)		1+			
Asplenium montanum		r			
Aster umbellatus		1-	+		
Betula alleghaniensis (SL)		1-			
Diervilla lonicera (SL)		1-			
Lycopodium selago *		+			
Lysimachia quadrifolia		+			
Maianthemum canadense		1-			
Menziesia pilosa (SL)		1-			
Prenanthes roanensis *		p			
Smilax tamnoides (SL)		+			
Tsuga caroliniana (SL)		+			
ANDROPOGON GERARDII-LIATRIS GRAMINIFOLIA-SENECIO PAUPERCULUS ALLIANCE					
Andropogon gerardii			1-	1-	+
Liatris graminifolia			+	1-	+
Senecio pauperculus			p	1+	1+
Andropogon scoparius	1+	1+	3	4	4
Allium cernuum			+	+	+
Aster dumosus			1+	+	+
Aster linariifolius			r	+	1-
Carya ovata (H/SL)			1+/2-	/p	/1+
Dichanthelium commutatum			+	+	+
Euphorbia corollata			+	1+	+
Lechea racemulosa			+	+	+
Pycnanthemum tenuifolium			+	2-	2-
Sericocarpus linifolius			+		+
Thalictrum revolutum			+	+	+
Woodsia scopulina			p	p	+
Salix occidentalis-Helianthemum bicknellii-Aletris farinosa Association					
Salix occidentalis	p		2-		
Helianthemum bicknellii *			+		
Aletris farinosa			p		
Habenaria ciliaris			p		
Lilium grayi *			p		
Polygala sanguinea			+		
Quercus alba (SL)			1+		
Rhynchospora globularis			p	+	
Salix humilis			p		
Juniperus virginiana-Quercus stellata/Castilleja coccinea Association					
Juniperus virginiana (H/SL)				+/1+	r/2-
Quercus stellata (H/SL)				1+/2-	/2+
Castilleja coccinea *				p	+
Asclepias verticillata				+	+
Galium pilosum				p	+
Helianthus divaricatus				p	1-
Muhlenbergia capillaris				+	1+
Polygonum tenue				+	+
Scleria pauciflora				1-	1-
Sorghastrum nutans				+	1+
Talinum teretifolium				+	p
Liatris spicata-Solidago rigida-Zizia aptera Subassociation					
Liatris spicata					1-
Solidago rigida *					+
Zizia aptera					1+
Aristida purpurascens					+
Fraxinus americana (SL)					1-

Table 2, Part 1. Provisional classification of Buffalo Mountain glade vegetation showing differential-species of the community-types, denoted by the boxes.

Plot Number	1	2	3	4	5
Danthonia spicata	+	+	1+	1-	+
Agalinis tenuifolia			p		r
Agrostis hyemalis		+	+	+	+
Amelanchier arborea (SL)		+			+
Antennaria plantaginifolia				+	+
Aristida dichotoma				+	+
Asplenium platyneuron					+
Aster divaricatus		1-			+
Aster undulatus				p	
Bromus pubescens					+
Bulbostylis capillaris				+	+
Campanula divaricata		r		+	
Carex complanata					+
Carex pensylvanica		2-			+
Carex umbellata			+		
Castanea dentata (SL)		+			
Cheilanthes lanosa				+	
Coreopsis major		1-	1-	+	
Crataegus flabellata (SL)		1-	+		
Dennstaedtia punctilobula		1+			
Dichanthelium acuminatum				p	
Dichanthelium depauperatum				+	
Festuca rubra		+	+		
Galium latifolium					+
Heuchera villosa		+			
Houstonia caerulea			+		
Houstonia purpurea					+
Hypericum gentianoides	+		+		+
Hypericum hypericoides				1-	
Hypericum punctatum				+	
Hypoxis hirsuta					+
Hystrix patula					+
Lespedeza virginica					+
Linum medium				+	
Mitchella repens		+			
Muhlenbergia mexicana					p
Ostrya virginiana (SL)					p
Panicum philadelphicum					+
Paronychia fastigiata					p
Pinus virginiana (SL)					1-
Poa compressa					+
Polypodium virginianum		p			
Potentilla simplex					1-
Prunus serotina					r
Quercus rubra (SL)		1+	1+		
Rosa carolina			+	1-	1-
Rubus flagellaris			1-	+	
Selaginella rupestris				+	+
Solidago arguta				p	
Solidago bicolor					+
Solidago juncea					p
Solidago nemoralis			+	+	1-
Solidago ulmifolia					+
Spiranthes cernua					+
Spiranthes gracilis					r
Sporobolus vaginiflorus					+
Uvularia perfoliata				p	
Vaccinium pallidum			1-		+
Vaccinium stamineum			1+	1-	
Viola fimbriatula			p	+	+

Shrub layer species, 1 to 6 m tall, are denoted by (SL); species occurring in both the herbaceous layer and the shrub layer are denoted by (H/SL), with the slash separating the herbaceous and shrub layer cover-abundance values in the table.
* Species considered to be rare in Virginia, according to Ludwig (1993).

Cover-Abundance Scale:

r	single individual	2+	12.5-25% cover
+	several, < 1% cover	3	25-50% cover
1-	1-2% cover	4	50-75% cover
1+	2-5% cover	5	75-100% cover
2-	5-12.5% cover	p	present outside plot

Table 2, Part 2. Additional species documented from Buffalo Mountain glade vegetation.

Figure 1. The lithophytic *Paronychia argyrocoma-Potentilla tridentata-Arenaria groenlandica* Association, showing the cushion growth form of *Paronychia argyrocoma*.

Figure 2. The *Salix occidentalis-Helianthemum bicknellii-Aletris farinosa* Association, an oligotrophic, edaphically maintained community-type apparently endemic to Buffalo Mountain.

Figure 3. Savanna-like vegetation of the *Juniperus virginiana-Quercus stellata/Castilleja coccinea* Association, here represented by the *Liatris spicata-Solidago rigida-Zizia aptera* Subassociation. The robust grass in the photograph is *Andropogon gerardii.*

stature of *Andropogon gerardii* and the absence of nutrient demanding plants (sensu Rawinski, 1992). Bluff Mountain in Ashe County, North Carolina is the only other site known to support similar high elevation mafic glade vegetation. Species shared between these two sites include *Helianthemum bicknellii, Aster linariifolius, Coreopsis major, Andropogon scoparius, Danthonia spicata, Potentilla tridentata, Aletris farinosa, Andropogon gerardii, Liatris graminifolia, Quercus alba, Kalmia latifolia, Vaccinium stamineum,* and *Salix humilis* (Schafale and Weakley, 1990; Tucker, 1972). Distinguishing species of the Buffalo Mountain vegetation include *Salix occidentalis, Sericocarpus linifolius, Senecio pauperculus, Woodsia scopulina, Habenaria ciliaris,* and *Rhynchospora globularis.* Absent from Buffalo Mountain are the Bluff Mountain species *Gentiana crinita, Helianthemum propinquum, Liatris aspera,* and *Phlox subulata.*

The *Juniperus virginiana-Quercus stellata/Castilleja coccinea* Association occurs on upper-mid to lower-mid slope positions. Colluvial processes and pronounced lateral drainage of water enrich the shallow soils here, as evidenced by head-high *Andropogon gerardii* and nutrient demanding plants (sensu Rawinski, 1992) such as *Solidago rigida, Solidago arguta, Bromus pubescens, Hystrix patula,* and *Helianthus divaricatus.* Wind exposure does not seem to be an important environmental factor, but instead, the rainless periods of summer and the southern aspect create extremely dry soils. The glade vegetation appears to be maintained by stressful edaphic conditions, although very old burn scars on the base of the gnarled and stunted *Quercus stellata* trees indicate past fire. Characteristic plants of this association include *Talinum teretifolium, Sorghastrum nutans, Muhlenbergia capillaris,* and *Asclepias verticillata.* The *Liatris spicata-Solidago rigida-Zizia aptera* Subassociation is a savanna-like (sensu Nelson, 1985) expression of the aforesaid association which occurs on the lowest glade (Figure 3). It is comparatively species-rich, containing an impressive total of 12 grass genera (Table 2). Conspicuous species such as *Liatris spicata, Solidago rigida, Zizia aptera, Solidago juncea, Paronychia fastigiata, Muhlenbergia capillaris,* and *Muhlenbergia mexicana* do not appear in Porter's (1975) flora of Buffalo Mountain, suggesting that this community's remote location kept it hidden from discovery until our work in 1991. To our knowledge, no other site in Virginia supports this type of vegetation, and very few sites can match its spectacular display of summer wildflowers.

Like serpentine soils, glade soils on Buffalo Mountain are characterized by friable consistence, seasonal wetness, erosiveness, bedrock exposures, magnesium-rich parent material, and a distinctive and diagnostic flora. According to Jenny (1980), the petrologic aluminum deficiency and the concomitant retardation in clay formation explain the erosiveness, shallowness, and mineral freshness of many serpentine soils and their conspicuous impact on vegetation. Walker (1954) also postulated that insufficient clay formation may explain the existence of only a thin soil mantle on many serpentine areas. We hypothesize that the soils on Buffalo Mountain are related to serpentine soils, and that clay deficiency indirectly created and maintains the open bedrock glades. Clay deficiency facilitates subsurface lateral drainage of water, which explains the existence of numerous seasonal seeps flowing across the mid-slope glades. The steady flow of seepage water in turn prevents or impedes soil development. Soil material that does form tends to be shallow and "mineral fresh" (sensu Jenny 1980), thus exposing the plant life to a relatively unweathered, high-magnesium soil environment. The glade soils appear to be well-supplied with water during spring and early summer, but during the rainless periods of summer, clay deficiency diminishes soil water holding capacity, thus leading to droughty conditions and xerophytic vegetation. Also, accelerated loss of soil moisture may occur because of the intense heat generated by black bedrock outcrops exposed to the summer sun. Detailed studies of the physical and chemical characteristics of the glade soils on Buffalo Mountain are needed to test or refine these hypotheses. Buffalo Mountain has long been recognized as a magnificent natural area, home to many rare plant and animal species. Our study shows that it also supports extremely rare, edaphically maintained glade communities worthy of continued study, appreciation, and protection.

Acknowledgments

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The Mammalian Fauna and Ectoparasites of George Washington Birthplace National Monument, Westmoreland County, Virginia

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The George Washington Birthplace National Monument (GWBNM) property includes about 218 hectares on the Potomac River in Westmoreland County, Virginia, about 130 km southeast of Washington, D.C. The property is in the Coastal Plain physiographic province and is very flat. In addition to the historic site and interpretive buildings surrounded by lawns and shrubs, a number of different habitats are found on the property. These include about 80 hectares of mixed-age woodlands dominated by loblolly pine (*Pinus taeda*) but with some hardwoods, mostly white oak (*Quercus alba*), tulip tree (*Liriodendron tulipifera*), and red maple (*Acer rubrum*), 60 hectares of farmland used for hay, 220 hectares of freshwater marsh adjacent to Pope's Creek, several meadows, two freshwater ponds, and a riverfront beach on the Potomac River which is tidal and slightly brackish. No inventory of the mammals of the GWBNM exists. The purpose of this report is to list the mammals observed at GWBNM and to annotate the list with observations and comments on ecology and behavior. The small mammals trapped and handled were examined for ectoparasites, which are also reported herein.

Materials and Methods

Small mammals were sampled primarily by trapping with Sherman and Hav-a-hart live traps. Museum Special snap-back traps and larger rat traps were used occasionally. Large mammals were observed as we walked the grounds or drove the roads, mostly at night. Mist nets were used on two occasions to sample bats.

Specimens were caught, identified, and released. A few of the small mammals killed in traps were saved as skins and skulls and deposited as vouchers in the collection at Northern Virginia Community College. Identifications were based on field characters as given in Burt & Grossenheider (1956) and Webster et al. (1985).

Observations began in March 1986 and continued at irregular intervals through April 1989. Observations were made in all months of the year except December. Twenty-four days of observing were performed with 1-13 observers. Sampling involved 13 nights of trapping. Approximately 480 man hours were spent in the field.

Eleven species of mammals were handled and examined for ectoparasites. Most were brushed with a test tube brush over a white pan and their parasites were then collected from the pan with forceps. Some live-trapped rodents were placed in a paper bag with para-dichlorobenzene crystals (PDB) for 2-3 minutes after which the host animal was identified, sexed, and released. Later, the PDB was examined for the presence of ectoparasites. Parasites were preserved in 70% ethanol, decolorized in 10% KOH, dehydrated in an ethanol series, cleared in xylene, and mounted on slides in Canada balsam. These parasites were deposited as voucher specimens in the Northern Virginia Community College parasite collection or the U. S. National Tick Collection.

Results

A list of mammals encountered at GWBNM is presented below. Twenty-two species of mammals belonging in 12 families of seven orders were observed or collected. Mammal names follow Jones et al. (1992).

Didelphis virginiana Kerr - Virginia opossums were seen on four occasions while we were driving roads at night. They were observed in meadow and woodland habitats and are considered common.

Blarina brevicauda (Say) - Three northern short-tail shrews were trapped in meadow habitats. Although the southern short-tail shrew, *Blarina carolinensis* (Bachman), has been reported to be sympatric with *B. brevicauda* in Westmoreland County (Pagels and French, 1987), it was not seen in this study.

Scalopus aquaticus (Linnaeus) - Runs of the eastern mole were very numerous in the sandy soil near Pope's Creek, but only a single specimen was captured. It is likely that this is the only species of mole at GWBNM.

Eptesicus fuscus (Beauvois) - A single adult male big brown bat was caught by hand in the employee residence building in May 1988. Large bats seen flying at dusk on several occasions may have been this species.

Lasionycteris noctivagans (LeConte) - One silver-haired bat was caught in a mist net over a stream in April 1988. These bats migrate northward through the area in the spring. Few records exist for this species in Virginia. The intestinal fluke, *Urotrematulum attenuatum*, was reported from this specimen (Eckerlin, 1988).

Sylvilagus floridanus (J. A. Allen) - The eastern cottontail was the only rabbit observed. It was seen on ten occasions in fields, meadows, and early successional stage shrub-woodland habitat.

Glaucomys volans (Linnaeus) - A southern flying squirrel was seen once at dusk in June 1988 as it emerged from a tree hole in a white oak.

Marmota monax (Linnaeus) - Woodchucks were common (eight sightings) in meadows and open areas along roads. Woodchucks were regarded as pests by GWBNM personnel because earthen mounds at den openings interfered with mowing operations.

Sciurus carolinensis Gmelin - Sightings of eastern gray squirrels were made in all months that we visited the site. This species was commonly seen near the residence and interpretive buildings where deciduous trees were common. The single nest of this species that we examined yielded 2 fleas, *Orchopeas howardi* (Baker).

Microtus pennsylvanicus (Ord) and *Microtus pinetorum* (LeConte) - A single specimen each of the meadow vole and the woodland vole was trapped in dry meadow habitat. Neither species was caught in wet meadow or marsh areas.

Peromyscus leucopus (Rafinesque) - Thirty-nine white-footed mice were trapped and most were released. This was the most common small mammal on the GWBNM as judged by our trapping success. White-footed mice were caught around buildings and in both deciduous and coniferous woodlands.

Ondatra zibethicus (Linnaeus) - Common muskrats were seen on four occasions in the water of Pope's Creek. The mound nests of the common muskrat were seen in the marshes adjacent Pope's Creek.

Oryzomys palustris (Harlan) - Marsh rice rats, nine individuals, were trapped on six of 13 trap nights. They were found in the marshes or in wet meadows near the marsh.

Castor canadensis Kuhl - American beavers were seen on only two occasions although their cuttings were seen on every visit. A young beaver was seen at night in the rain while it was walking on a road.

Mus musculus Linnaeus and *Rattus norvegicus* (Berkenhout) - The non-native house mouse and Norway rat were both common around the barns and out buildings where domestic animals (pigs, cows, sheep) and their food were kept. They were regarded as pests by the GWBNM personnel because they stole food and gnawed on wooden structures. Traps set in the animal buildings on ledges and rafters caught no black rats, *Rattus rattus* Linnaeus.

Urocyon cinereoargenteus (Schreber) - A single common gray fox was seen at dusk on 23 August 1987 crossing from a cultivated field into a pine woods.

Procyon lotor (Linnaeus) - Common raccoons were seen, usually at night, on six of 13 visits. A group of five was seen in a cornfield when ripe corn was available.

Mephitis mephitis (Schreber) - A striped skunk was seen on only one occasion.

Mustela vison Schreber - Tracks of mink were seen in the sand and mud along the Potomac River.

Odocoileus virginianus (Zimmerman) - White-tailed deer were seen on every visit to the GWBNM. As many as 21 were counted on each of two occasions. The herd included a mature six point buck and an animal that was partially albinistic, with large patches of white on the flanks.

A list of ectoparasites found on the 65 small mammals handled is presented in Table 1. The terms prevalence and mean intensity are used as defined by Margolis et al. (1982).

Table 1. Prevalence and intensity of ectoparasites from 65 small mammals examined from the George Washington Birthplace National Monument, Westmoreland County, Virginia.

Mammal species	Parasite Prevalence	Parasite	Parasite Mean intensity
Blarina brevicauda	1/2	*Ctenophthalmus pseudagyrtes* Baker, 1904	1.0
Scalopus aquaticus	0/1		
Eptesicus fuscus	0/1		
Lasionycteris noctivagans	0/1		
Mus musculus	0/6		
Rattus norvegicus	0/3		
Sciurus carolinensis	1/1	*Orchopeas howardi* (Baker, 1895)	2.0
Microtus pennsylvanicus	1/1	*Dermacentor variabilis* (Say, 1821)	1L;18N *[1]
Microtus pinetorum	1/1	*Ctenophthalmus pseudagyrtes* Baker, 1904	1.0
Oryzomys palustris	0/9		
Peromyscus leucopus	11/39	*Orchopeas leucopus* (Baker, 1904)	2.8
	7/39	*Epitedia wenmanni* (Rothschild, 1904)	2.0
	4/39	*Stenoponia americana* (Baker, 1899)	1.3
	2/39	*Dermacentor variabilis* (Say, 1821)	L 2.5[2]
	1/39	*Amblyomma americanum* (Linnaeus, 1758)	L 1.0
	1/39	*Cuterebra* sp.	1.0

* L= larva; N= nymph

[1] Vouchers deposited into U. S. National Tick Collection, RML accession number 119182

[2] Vouchers deposited into U. S. National Tick Collection, RML accession numbers 119180, 119181

Discussion

We observed that deer were mostly small and appeared stunted, although no hard data were collected. In the early spring, we noted that the browse, consisting mostly of briar (*Smilax* spp.) and poison ivy (*Rhus radicans*), was eaten down to bare stubs. It was possible to see for considerable distances where the deer had removed the understory cover. We believe that the deer herd has probably reached or exceeded the carrying capacity of the property, and that the herd has members that are stunted and inbred. Albinism is usually inherited in other mammalian species as a Mendelian recessive trait and has been seen in other deer herds. For the trait to express itself phenotypically in an individual, there was probably interbreeding between deer who were carriers of the allele. This would suggest close inbreeding among members of this small population.

A reduction of the deer herd would be desirable from a management point of view. McShea & Rappole (1992) have shown that understory cover increased and provided habitat for a greater number and variety of small mammals and ground nesting birds when the impact of deer browsing was reduced or eliminated. The deer would probably benefit as a result of reduced transmission of parasites and diseases, and an increase in available food.

From a human health point of view, fewer deer in an area will equate to fewer risks of human cases of Lyme disease transmitted by the deer tick, *Ixodes dammini* Spielman, Clifford, Piesman, & Corwin, 1979 as shown by Steere & Malawista (1979) and Steere et al. (1983). Recently, *Ixodes dammini* has been reduced to a junior synonym of the black-legged tick, *Ixodes scapularis* Say, 1821 by Oliver et al. (1993). Since the GWBNM property is heavily used by humans, this may be an important consideration. However, no deer ticks were found in this study.

All flea species found are common parasites on their host species in Virginia (Benton, 1980), as is the botfly, *Cuterebra* sp., yet Westmoreland County is a new locality for each. The American dog tick, *Dermacentor variabilis*, is the most important vector of Rocky Mountain Spotted Fever in the United States, it transmits tularemia to humans and many wildlife species, and it causes tick paralysis (Sonenshine, 1979). Westmoreland County is a

new locality for this common and widespread tick. The lone star tick, *Amblyomma americanum*, is also an important vector of Rocky Mountain Spotted Fever and it was previously reported from Westmoreland County by Sonenshine (1979).

The number of mammal species encountered in this study (22) is comparable to that found at other sites of about the same size in eastern Virginia. At Presquile National Wildlife Refuge in Chesterfield County, Jackson et al. (1976) reported 22 species but included no bats. Seventeen species were common to both Presquile and GWBNM. At Mackay Island National Wildlife Refuge in the City of Virginia Beach, de Rageot (1992) found 19 species of mammals, 12 of which were also found at GWBNM. Differing amounts of effort, times of observations, methods employed (both studies cited above examined owl pellets), habitat differences, and geographical differences make more direct comparison futile. At GWBNM, as at the other sites where preliminary inventories have been made, additional observation will surely add additional species of mammals to the list.

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Moth Records from Burkes Garden, Virginia

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In contrast to butterflies (Clark & Clark, 1951; Covell, 1972), the species composition and distribution of moths have not been well-studied in Virginia. The proceedings of a recent (1989) symposium (Terwilliger, 1991) detailed the biological and legal status of numerous plants and animals found in the Commonwealth. Nine species of Lepidoptera were reported, with only one moth (*Catocala herodias gerhardi* Barnes & Benjamin) designated as threatened (Schweitzer, in Hoffman, 1991). Covell (1990) suggested that baseline data are needed to understand the diversity and population dynamics of both moths and butterflies. He urged that more resources be appropriated in order to develop regional lepidopteran checklists, and to learn how best to preserve these insects as components of our natural heritage.

During the summer of 1987, the foraging strategies of a population of rare bats was studied in Burkes Garden, Virginia by Virginia M. Dalton. Nocturnal flying insects were sampled on a weekly basis to determine local species composition and abundance. The specimens accumulated by these surveys provide material for taxonomic baseline inventories of this interesting part of southwestern Virginia, toward which the following summary of the moths is an initial contribution.

Materials and Methods

Burkes Garden is a high, almost completely enclosed limestone-bedded valley located in the Ridge & Valley Physiographic Province in the northeastern quadrant of Tazewell County (Cooper, 1944, Hoffman & Kleinpeter, 1948). The mean level of the valley floor is about 1060 m above sea level, and the surrounding rim of mountains rise to 1360 m. Burkes Garden has the shortest growing season (159 days) recorded in Virginia (Crockett, 1972), and an average annual rainfall of about 119 cm (47 inches) (Cooper, 1944). The region was formerly characterized by oak-chestnut forest, but the chestnut (extirpated in Virginia) is now replaced largely by hickory. Remnants of relict boreal forest persist at elevations above 1100 m; Beartown Mountain on the western rim retains a vestige of the red spruce forest that occurred there prior to intensive lumbering in the early decades of this century. Above 1050 m occurs a northern hardwoods forest with a mixture of spruce (*Picea rubens* Sarg.), American beech (*Fagus grandifolia* Erhr.), and yellow birch (*Betula alleghaniensis* Britt.) (Woodward & Hoffman, 1991). The valley floor has been largely deforested and converted into pastureland. Sinkholes, caves, and springs are of frequent occurrence.

The moths examined in this study were trapped mostly in the western end of Burkes Garden, in the general vicinity of Station Spring at an elevation of about 1100 m.. Collections were made with two 15-watt blacklight traps each containing a 200 ml jar with a paper towel moistened with ethyl acetate. Sampling was conducted between sunset and sunrise; collecting jars were removed from the traps hourly and placed on ice.

More than 1,350 adult moths were captured during the 1987 season; all identifications were made by the author. The total number of moths is somewhat greater than the total accounted in the following lists, as some were too tattered and worn to permit accurate identification. The Lepidoptera from the Dalton survey are deposited in the VPI&SU Branch of the Virginia Museum of Natural History, Blacksburg, Virginia.

In the following lists, species are arranged in the sequence adopted by Hodges et al. (1983). When no number follows a species name in the "No. collected" column, one specimen of such species is implied.

List of Species

Checklist no. Hodges et al., 1983		No. collected
	Oecophoridae	
882	*Agonopterix robiniella* (Packard)	
992	*Ethmia zelleriella* (Chambers)	
1003	*Ethmia trifurcella* (Chambers)	
	Cosmopterigidae	
1524	*Triclonella pergandeella* Busck	
	Epermeniidae	
2330	*Epermenia pimpinella* Murtfeldt	33
	Yponomeutidae	
2401	*Ateva punctella* (Cramer)	8
	Sesiidae	
2554	*Synanthedon acerni* (Clemens)	2
	Tortricidae	
3492	*Cydia pomenella* (Linnaeus)	
3632	*Choristoneura fractivittana* (Clemens)	
	Limacodidae	
4652	*Tortricidia testacea* Packard	19
4654	*Tortricidia flexuosa* (Grote)	7
	Pyralidae	
4949	*Ostrinia nubilalis* (Hübner)	
4980	*Helvibotys helvialis* (Walker)	5
5159	*Desmia funeralis* (Hübner)	
5241	*Pantographa limata* (Grote & Robinson)	7
5524	*Hypsopygia costalis* (Fabricius)	
5627	*Omphalocera munroei* Martin	
	Thyrididae	
6077	*Thyris sepulchralis* Guerin	
	Thyatiridae	
6237	*Pseudothyatira cymatophoroides* (Guenée)	2
	Drepanidae	
6251	*Drepana arcuata* Walker	12
	Geometridae	
6261	*Heliomata cycladata* Grote & Robinson	15
6273	*Itame pustularia* (Guenée)	11
6278	*Itame evagaria* (Hulst)	2
6299	*Itame coortaria* (Hulst)	10
6331	*Semiothisa promiscuata* Ferguson	
6348	*Semiothisa fissinotata* (Walker)	3
6360	*Semiothisa quadrinotaria* (Herrich-Schäffer)	10
6386	*Semiothisa ocellinata* (Guenée)	14
6443	*Glenoides texanaria* (Hulst)	
6583	*Anacamptodes ephyraria* (Walker)	2
6586	*Anacamptodes defectaria* (Guenée)	
6588	*Iridopsis larvaria* (Guenée)	12
6590	*Anavitrinella pampinaria* (Guenée)	4
6597	*Ectropis crepuscularia* (Denis & Schiffermuller)	2
6620	*Melanolophia canadaria* (Guenée)	2
6621	*Melanolophia signataria* (Walker)	36
6640	*Biston betularia* (Linnaeus)	26
6667	*Lomographa vestaliata* (Guenée)	
6704	*Erastria coloraria* (Fabricius)	
6735	*Euchlaena pectinaria* (Denis & Schiffmuller)	2
6739	*Euchlaena irraria* (Barnes & McDunnough)	5
6743	*Xanthotype sospeta* (Drury)	
6753	*Pero honestaria* (Guenée)	3
6797	*Ennomos magnaria* Guenée	108
6798	*Ennomos subsignaria* (Hübner)	3
6837	*Probole nyssaria* (Guenée)	5
6841	*Plagodis keutzingi* (Grote)	
6842	*Plagodis phlogosaria* (Guenée)	3
6843	*Plagodis fervidaria* (Herrich-Schäffer)	
6884	*Besma endropiaria* (Grote & Robinson)	10
6965	*Eugonobapta nivosaria* (Guenée)	
6987	*Antepione thisoaria* (Guenée)	5
7047	*Nemoria rubrifrontaria* (Packard)	
7196	*Eulithis diversilineata* (Hübner)	
	Lasiocampidae	
7698	*Malacosoma disstria* Hübner	4
7701	*Malacosoma americanum* (Fabricius)	35
	Saturniidae	
7708	*Citheronia sepulcralis* Grote & Robinson	
7715	*Dryocampa rubicunda* (Fabricius)	5
7719	*Anisota senatoria* (J. E. Smith)	
7757	*Antherea polyphemus* (Cramer)	3
7758	*Actias luna* (Linnaeus)	2
7767	*Hyalophora cecropia* (Linnaeus)	

	Sphingidae	
7775	*Manduca sexta* (Linnaeus)	
7787	*Ceratomia undulosa* (Walker)	3
7809	*Sphinx kalmiae* (J. E. Smith)	2
7824	*Paonias excacaetus* (J. E. Smith)	4
7825	*Paonias myops* (J. E. Smith)	8
7894	*Hyles lineata* (Fabricius)	
	Notodontidae	
7915	*Nadata gibbosa* (J. E. Smith)	14
7919	*Peridea basitriens* (Walker)	
7921	*Peridea ferruginea* (Packard)	5
7951	*Symmerista albifrons* (J. E. Smith)	12
7957	*Dasylophia anguina* (J. E. Smith)	7
7975	*Macrurocampa marthesia* (Cramer)	
7994	*Heterocampa guttivitta* (Walker)	3
7995	*Heterocampa biundata* (Walker)	
7998	*Lochmaeus manteo* Doubleday	
7999	*Lochmaeus bilineata* (Packard)	
8011	*Schizura leptinoides* (Grote)	
8012	*Oligocentria semirufescens* (Walker)	3
8017	*Oligocentria lignicolor* (Walker)	2
	Arctiidae	
8089	*Hypoprepia miniata* (Kirby)	17
8090	*Hypoprepia fucosa* (Kirby)	17
8098	*Clemensia albata* (Packard)	
8140	*Hyphantria cunea* (Drury)	78
8170	*Apantesis vittata* (Fabricius)	3
8197	*Grammia virgo* (Linnaeus)	
8203	*Halysidota tessellaris* (J. E. Smith)	25
8211	*Lophocampa caryae* Harris	7
8214	*Lophocampa maculata* Harris	
8255	*Pygarctia abdominalis* Grote	2
8262	*Ctenucha virginica* (Esper)	
8267	*Cissiceps fulvicollis* (Hübner)	
	Lymantriidae	
8294	*Dasychira vagans* (Barnes & Benjamin)	
8316	*Orgyia leucostigma* (J. E. Smith)	9
	Noctuidae	
8443	*Bomolochia bijugalis* (Walker)	
8534	*Plusiodonta compressipalpis* Guenée	
8689	*Zale lunata* (Drury)	
8719	*Euparthenos nubilis* (Hübner)	
8727	*Parallelia bistriaris* Hübner	
8739	*Caenurgina erechtea* (Cramer)	15
8784	*Catocala obscura* Strecker	
8788	*Catocala retecta* Grote	2
8792	*Catocala vidua* (J. E. Smith)	
8797	*Catocala subnata* Grote	2
8846	*Catocala sordida* Grote	2
8857	*Catocala ultronia* (Hübner)	3
8858	*Catocala crataegi* Saunders	2
8863	*Catocala mira* Grote	2
8864	*Catocala grynea* (Cramer)	5
8867	*Catocala blandula* Hulst	2
8876	*Catocala micronympha* Guenée	
8887	*Trichoplusia ni* (Hübner)	2
8924	*Anagrapha falcifera* (Kirby)	7
9062	*Cerma cerintha* (Treitschke)	
9146	*Acontia delecta* Walker	
9199	*Acronicta rubricoma* Guenée	
9207	*Acronicta innotata* Guenée	5
9221	*Acronicta funeralis* Grote & Robinson	2
9226	*Acronicta superans* Guenée	
9237	*Acronicta interrupta* Guenée	3
9241	*Acronicta fragilis* (Guenée)	4
9243	*Acronicta ovata* Grote	
9250	*Acronicta inclara* J. E. Smith	
9251	*Acronicta retardata* (Walker)	3
9254	*Acronicta afflicta* Grote	5
9284	*Agriopodes teratophora* (Herrich-Schäffer)	
9348	*Apamea amputatrix* (Fitch)	
9457	*Amphipoaea americana* (Speyer)	2
9545	*Euplexia benesimilis* McDunnough	
9669	*Spodoptera ornithogalli* (Guenée)	12
9684	*Elaphria grata* Hübner	
9688	*Galgula partita* Guenée	4
9699	*Platysenta sutor* (Guenée)	
9889	*Lithophane petulca* (Grote)	
9939	*Eupsilia devia* (Grote)	
9957	*Sunira bicolorago* (Guenée)	
10292	*Melanchra adjuncta* (Guenée)	
10304	*Trichordestra legitima* (Grote)	6
10397	*Lacinipolia renigera* (Stephens)	174
10406	*Lacinipolia olivacea* (Morrison)	
10431	*Faronta diffusa* (Walker)	17
10438	*Pseudaletia unipuncta* (Haworth)	29
10446	*Leucania multilinea* (Walker)	62
10455	*Leucania scirpicola* Guenée	11
10462	*Leucania pseudargyria* Guenée	2
10502	*Himella intracta* (Morrison)	
10659	*Agrotis volubilis* Harvey	
10661	*Agrotis malefida* Guenée	2
10663	*Agrotis ipsilon* (Hufnagel)	47
10670	*Feltia jaculifera* (Guenée)	3
10674	*Feltia subgothica* (Haworth)	
10762	*Euxoa divergens* (Walker)	3
10805	*Euxoa tesselata* (Harris)	13
10851	*Euxoa redimicula* (Morrison)	3
10891	*Ochropleura plecta* (Linnaeus)	51
10926	*Spaelotis clandestina* (Harris)	9
10942.1	*Xestia dolosa* Franclemont	105
11029	*Abagrotis alternata* (Grote)	2
11068	*Helicoverpa zea* (Boddie)	4

Results and Discussion

The 160 species of moths reported here from Burkes Garden are surely only a fraction of the total expected from the region. The "microlepidoptera" in particular are strikingly underrepresented. Prolonged and specialized collecting might account for as many as 800 local species. No estimates are available for the number of moths native to Virginia, but the numbers recorded for the nearby states of Kentucky and Ohio are approximately 2,320 and 2,520, respectively (C. V. Covell and E. H. Metzler, pers. comm.).

Nonetheless, the results of this study provide initial baseline data on the diversity of the Burkes Garden moth fauna, as well as a first step toward achieving comparable information for the entire Commonwealth. Numerous inventory studies, for which the aid of volunteer amateur lepidopterists should be actively enlisted, would provide badly needed information about the geographic and seasonal occurrence of Virginian Lepidoptera. The availability of such data would permit identification of populations requiring legal protection.

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Serrobius pulchellus Causey, a Poorly Known Centiped, Rediscovered in Virginia (Lithobiomorpha: Lithobiidae)

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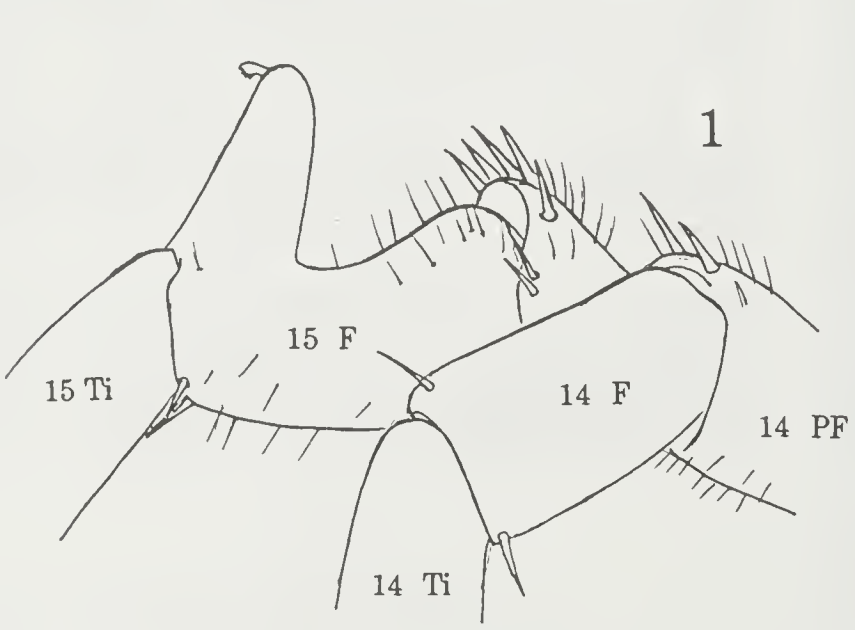
During the process of sorting and housing extensive material of myriapods and arachnids generously donated to the Virginia Museum of Natural History by Prof. William A. Shear (Hampden-Sydney College), I was able to identify some small lithobiomorph centipeds, one of which represents a species named from North Carolina and never subsequently recorded. This revelation led to a search for additional specimens among the museum's unidentified material of lithobiids. Some, indeed, were located, and an account of the taxonomic status of the species is being prepared for publication elsewhere. More significant, however, was the purely incidental discovery of several samples of *Serrobius pulchellus*, a remarkable species named by Nell B. Causey in 1942 and never, to the best of my knowledge, subsequently mentioned in chilopod literature. It is now possible to record it from three new localities which greatly extend its range northward, and to confirm the validity of both the genus and species, while raising some points for further investigation.

The original description (Causey, 1942) of *S. pulchellus* is fairly detailed, and includes an illustration of the strongly modified ultimate leg of males. No further locality than "Duke Forest" was provided, and the depository of the type material was stated to be the Academy of Natural Sciences, Philadelphia. As so often the case with Causey types, these specimens apparently did not reach this destination (*fide* R. E. Crabill, who long ago investigated the matter), and it is not known to me if any are still extant.

The "Duke Forest" is composed of a number of forested areas dispersed over several Piedmont counties



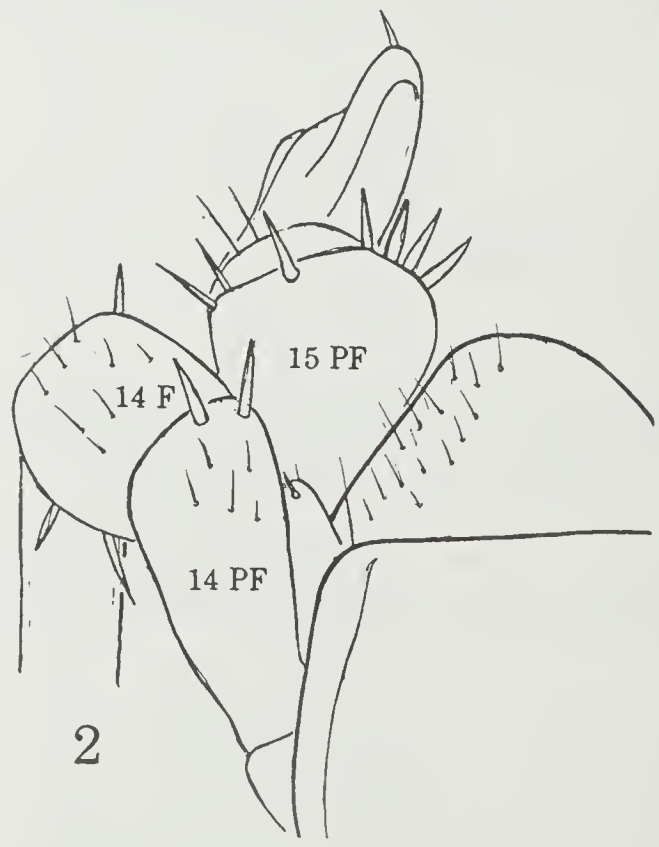


Figure 1. Basal podomeres of 14th and 15th legs of male *Serrobius pulchellus*, specimen from Elm Hill Game Management Area, Mecklenburg Co., Va., lateral aspect. Fig 2. The same podomeres, dorsal aspect. F, femur, PF, prefemur, Ti, tibia.

in North Carolina, but a clue about the precise type locality is provided in a paper on the Pauropoda of the Forest. J. H. Starling extracted pauropods from soil samples taken in four sample plots in the "Durham Division" [Orange County, just west of Duke University] between 17 November 1940 and 13 January 1942, and in the published version of his dissertation (Starling, 1944) provided lists of all the "myriapods" taken during these activities (identifications by N. B. Causey). Five specimens of *Serrobius pulchellus* (the generic name misspelled *Serrabius*) were thus recorded from plots 2, 3, and 4, approximately the same number as stipulated for the type series.

The species was nominally mentioned in the 2nd and 3rd supplements to "The Insects of North Carolina" (Wray, 1950, 1967), but to my knowledge has not subsequently appeared in print. In both personal conversations and letters over many years, the late R. E. Crabill expressed skepticism about the status of the genus, but in the lack of material could reach no conclusion. Material in the VMNH collection agrees so closely with the original description that no doubt attends the identification. The following Virginia localities are represented:

Floyd Co.: Buffalo Mountain, 9.5 km SE of Willis, cool moist northern hardwood forest on north slope at 3500 ft., one male hand-collected 15 July 1992 (VMNH survey). **Mecklenburg Co.**: Elm Hill State Game Management Area, pitfall site near the Kerr Dam powerhouse, one male trapped during the period 3-17 July 1991 (VMNH survey). **Prince Edward Co.**: Hampden-Sydney College campus, two males taken by berlese extraction of oak-pine litter, 20 November 1987 (W. A. Shear). The known range now encompasses a triangular area roughly 140 km in a north-south direction, and about 170 km northwest-southeast. This area will surely be much increased with further litter sampling.

The localities in Mecklenburg and Prince Edward counties lie in the Virginia Piedmont almost directly north of Durham and in basically the same major habitat type (mixed oak-pine), so that the occurrence of *pulchellus* there is not surprising. The find at Buffalo Mountain is distinctly unexpected, as the biotope is a cool northern hardwood forest dominated by tulip poplar (*Liriodendron tulipifera*), striped maple (*Acer spicatum*), and yellow birch (*Betula alleghaniensis).* Obviously the species can successfully occupy a diversity of habitats, w th a vertical distribution of from about 300 to 3500 ft. (90 to 1100 m.).

During the past eight decades, the number of genera proposed for lithobiids in eastern North America has increased dramatically, although no attempt has been made to achieve any kind of suprageneric groupings. Even the carefully documented early papers (e.g., 1922) by R. V. Chamberlin treated genera randomly and opportunistically. In the lack of modern revisionary studies (Chamberlin, for instance, considered **any** single difference to be one of specific value) of the rich and varied Nearctic fauna, it is impossible to express any realistic views about the systematic position of *Serrobius*. Causey (op. cit., p. 79) noted a possible relationship with *Neolithobius*, largely because of similarity of the last pair of male legs to those of *N. xenopus* (Bollman). This perception may be correct, but concurrence in other characters such as small size, 30 antennomeres, and 5+5 prosternal teeth suggests affinity with *Sozibius*. Females of *pulchellus*, for instance, are not easy to distinguish from those of local sozibiids, although the strongly modified 15th legs of the males would seem to justify generic status. I believe that the presence of 5-8 dorsal spurs on the ultimate leg prefemur (Fig. 1) is unique within the family and not even approximated by any other known species (but see remarks below).

Heretofore, variations in the spurulation of lithobiid legs (codified admirably by Crabill, 1962) have enjoyed a high priority in the definition of taxa. Until far more detailed studies have been conducted, it is impossible to know whether Chamberlinian "species" are actually species in the genetic sense, subspecies, or merely expressions of geographic (or even individual) variation. It is my suspicion that better insights into generic classification will derive from antennal, prosternal, secondary sexual, and qualitative plectrotaxic characters.

The three male specimens of *pulchellus* at hand provide a microcosmic insight into some of the problems. Those from Mecklenburg and Floyd counties agree quite closely with Causey's description particularly as regards modifications of the 15th male leg, the prefemur of which has the supernumerary 7 - 7 dorsal spurs (it is impossible to state which is anterior, median, or posterior) that characterize the genus and can confidently be considered as *S. pulchellus*. The male from Prince Edward County has the podomeres modified exactly as shown in Causey's drawing, but none have more than the customary three dorsal spurs (AMP) that occur on most lithobiids, as shown by the plectrotaxic table below. Chamberlinian taxonomy would surely have given this specimen specific (if not generic) recognition. But is this difference – surely an important one – constant? Such a species, if confirmed, could be regarded an evolutionary link between *Serrobius* and, for instance, *Sozibius*. Only the second page has been written in the history of this

taxon, and already we must invoke the traditional apology "More studies are needed."

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	Dorsal					Ventral				
	C	TR	P	F	TI	C	TR	P	F	TI
12	-	-	amp	p	p	-	-	amp	amp	m
13	-	-	amp	p	p	-	-	amp	amp	m
14	-	-	am	p	p	-	m	amp	amp	m
15	-	-	am	m	-	-	m	mp	amp	m

Table 1. Qualitative plectrotaxy of last four pairs of legs of male *Serrobius pulchellus* from Hampden-Sydney College, Prince Edward Co., Va. In the other two males examined, and in the type material, there are 7 spurs in series DP on leg 15 instead of **a** and **m**.

Abbreviations: A, anterior, M, median, p, posterior; C, coxa, TR, trochanter, P, prefemur, F, femur, TI, tibia.

Banisteria, Number 2, 1993

Pyrrhalta rufosanguinea (Coleoptera: Chrysomelidae): A Monophagous Leaf Beetle of *Rhododendron periclymenoides* (Ericaceae)?

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The seventeen native American azalea species are deciduous members of the genus *Rhododendron*. *Rhododendron periclymenoides* (Michaux) Shinners, formerly known as *R. nudiflorum* (L.) Torrey, occurs in Virginia from the lower elevations of the Blue Ridge to the Coastal Plain. *Rhododendron atlanticum* (Ashe) Rehder is a species of the Coastal Plain and Fall Belt. These two species have been reported to hybridize wherever their ranges overlap (Galle, 1967) but no detailed analysis of the pattern of hybridization has been conducted. My morphometric and chemical analyses of natural hybridization between these two ericaceous shrubs (in progress) indicates introgression to both azalea species.

In 1982, I collected herbivorous insects from seven native azalea species in six southeastern states. One of these phytophagous insects was a reddish-brown leaf beetle about 5 mm long which was feeding on the leaves of *R. periclymenoides*. This beetle was identified by R. E. White (USDA, Systematic Entomological Laboratory, Beltsville, MD) as *Pyrrhalta* (=*Tricholochomaea*) *rufosanguinea* (Say). Wilcox (1979) reported *R. periclymenoides* as a host plant of *P. rufosanguinea* but I found no other information on its host range or biology. In 1985, I surveyed six populations of *R. periclymenoides*, two populations of *R. atlanticum* and a putative hybrid population in central Virginia for herbivorous insects. I found *P. rufosanguinea* only on *R. pericly-*

menoides plants. In the putative hybrid population, I found leaf beetle damage judged to be caused by *P. rufosanguinea* only on *R. periclymenoides* or on plants believed to be introgressants to this species but no leaf beetles were seen. I also found a mixed population of *R. periclymenoides* and *R. serrulatum* (Small) Millais and observed the leaf beetle only on *R. periclymenoides*. My previous taxonomic work (King, 1977, 1980) suggested that *R. periclymenoides* is evolutionarily most closely related to *R. canescens* (Michaux) Sweet and *R. roseum* (Loisel.) Rehder. Li (1957) treated all three species along with *R. alabamense* Rehder as a species group. In my 1982 survey I did not find *P. rufosanguinea* on *R. canescens, R. roseum* or *R. alabamense* nor on the distantly related *R. calendulaceum* (Michaux) Torrey, but only one to three populations of each were examined.

The populations of *R. periclymenoides* that I examined were found intermixed with *Kalmia latifolia* L., *Vaccinium corymbosum* L., *Vaccinium stamineum* L. and *Gaylussacia baccata* (Wang.) K. Koch, which are all ericaceous shrubs. *Pyrrhalta rufosanguinea* was not found on any of these plant taxa. Wilcox (1979) reports *Pyrrhalta kalmiae* (Fall) from *K. latifolia, P. vaccinnii* (Fall) from five species of *Vaccinium*, and *P. sablensis* Brown from *Vaccinium macrocarpon* Ait. I did not see any of these leaf beetles in the azalea populations that I studied. I have not yet searched plants outside of the family Ericaceae for the presence of *P. rufosanguinea*, but my field work to date suggests that the adult leaf beetles are monophagous for *Rhododendron periclymenoides*.

I found no literature on the life history of *P. rufosanguinea*. In my study, I first found adult beetles in the field in central Virginia in late May. In June of 1989 I collected beetles from six populations of *R. periclymenoides* ranging in size from about 25 to several hundred individuals. The beetles were usually present on the upper leaf surfaces and not abundant. I visited each population daily for 15 days and collected 150 beetles. The populations were visited in a different order each day so that morning, mid-day and late afternoon collections would be included for each population. I made only casual field observations in July and August. No observations of nocturnal behavior have been made. Beetles that were collected were maintained in one gallon plastic cages in an incubator from June 1 through November 8 and fed *R. periclymenoides* foliage freshly collected or stored in sealed plastic bags in a refrigerator for 2 - 3 days. The last foliage collected (October 5) was stored in a refrigerator and used in an attempt to maintain the colony until November 8. I made no attempt to collect foliage after October 5 because leaf senescence had begun. Stems of the plants were inserted into plastic vials of water and placed in the bottom of the cages. Fresh foliage was added every 2 - 3 days and older foliage removed in 5 - 6 days. The incubation conditions were 20°C and 80 - 90% relative humidity with a 14 hr photoperiod (400 footcandles). I eventually covered the cages with 50% shade cloth because this seemed to enhance feeding behavior.

Laboratory females laid pale yellow-orange eggs in clusters of 8 - 10 beneath the leaves, in the axils of leaves, or in the forks of small twigs. I assumed that the leaves of *R. periclymenoides* are the natural food for the larvae, so I transferred about 20 eggs to moist paper towels placed in the bottom of small plastic cages. I added fresh leaves each day. The eggs hatched in 7 - 10 days in the incubator and developed into black larvae that mined the azalea leaves. Only three were successfully reared to adults. I have not seen eggs and larvae in the field.

Although more detailed study is needed, the life cycle of *P. rufosanguinea* resembles that described for the elm leaf beetle (*P. luteola* (Muller); Johnson & Lyon 1988). The number of generations per year and the life span of adults of *P. rufosanguinea* are unknown but, like the elm leaf beetle, adults probably overwinter in protected areas and there are probably 2 -3 generations each year. In the laboratory colony of *P. rufosanguinea*, adult mortality was low from June through August (3%) but increased to 50% by October. By November, the remaining beetles had ceased to feed on the foliage stored in the refrigerator. I made an unsuccessful attempt to feed them thawed foliage that had been kept frozen at -30°C since July. The colony was terminated on November 8. A number of factors may have contributed to the increasing mortality including senescence of the beetles and decreasing palatability of the leaves.

Collection sites and numbers for *R. periclymenoides* from which *P. rufosanguinea* was collected are as follows: Virginia: **Caroline** Co.: U.S. Route 301, 4.2 km north of Dawn (*King 2300*); U.S. Route 1, 4.8 km south of Carmel Church along North Anna River and Long Creek (*King 2230*); **Hanover** Co.: U.S. Route 1, 6.4 km north of Ashland, Little River (*King 2260*); Virginia Route 54 about 8 km west of Ashland, South Anna River (*King 2220*); Mechumps Creek, County Route 662, about 3.2 km east of Ashland (*King 2250-1*); logging road off County Route 662, about 3.2 km to intermittent stream (*King 2250-2*).

Acknowledgments

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Subcoccinella vigintiquatuorpunctata (L.), First Virginia Record and New North American Host of an Adventive Lady Beetle (Coleoptera: Coccinellidae)

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Subcoccinella vigintiquatuorpunctata (L.) belongs to the phytophagous subfamily Epilachninae of a mainly predacious family, the Coccinellidae or lady beetles. It is widely distributed in the Old World, ranging throughout Britain and continental Europe and occurring in parts of northern Africa, Asia Minor, and the former USSR. The broad host range includes more than 70 plant species, but Caryophyllaceae and Fabaceae are favored; this lady beetle is a pest of alfalfa *(Medicago sativa* L.) in Europe (USDA, 1974; Richards et al., 1976; Ali, 1979). Adults and larvae feed from the abaxial surface of host foliage, cleaning out the lower epidermis and palisade cells. Injured leaves, which have the upper epidermis intact, show a characteristic lacework of transparent, parallel strips. Univoltine in Britain, populations on the European continent are generally bivoltine; the adults overwinter in protected sites near host plants (Marriner, 1927; Tanasijević, 1958; Richards et al., 1976; Ali, 1979; Wheeler & Henry, 1981; Baldwin, 1988).

This common Palearctic coccinellid was first collected in North America in Pennsylvania in 1972 and New Jersey in 1973 (USDA, 1974). Known unofficially in the United States as the European alfalfa beetle, it has since been recorded from Maryland, Missouri, New York, Ohio, and West Virginia. Populations have been found mainly on bouncing bet *(Saponaria officinalis* L., Caryophyllaceae) along railroad rights-of-way, and rail traffic is believed to have helped disperse the beetle following its apparent accidental introduction with commerce. Larval development has been limited to caryophyllaceous plants: white campion *(Silene latifolia* Poiret = *Lychnis alba)* and wild pink *(S. caroliniana* var. *pensylvanica* (Michx.) Fern.), in addition to *Saponaria officinalis*. Adult feeding has been observed on tall oatgrass *(Arrhenatherum*

elatius (L.) J.& C. Presl., Poaceae). Nearctic populations are chiefly univoltine (Wheeler & Henry, 1981; Gordon, 1985).

Joint state-federal surveys for this potentially economic insect were discontinued after the mid-1970s when it became apparent that this coccinellid posed no immediate threat to alfalfa. It is desirable, however, to document the habits and further spread of all unintentionally introduced insects, regardless of their applied significance. Such information, even when accumulated during unsystematic surveys, helps in analyzing pathways of introduction and subsequent dispersal of nonindigenous organisms; and it could become crucial if a particular species eventually assumes economic importance. Herein I report Virginia as a new state record for the European alfalfa beetle and fire pink *(Silene virginica* L.) as a new host.

Collection Data and Observations

On 7 May 1993, I discovered *S. vigintiquatuorpunctata* on *S. virginica* growing on a shaly roadcut bank and in dry woods along Seneca Hollow Road (Rt. 821), 2.9 km southwest of Ironto, Montgomery County. One adult (probably an overwintered individual) was collected (deposited in the Virginia Museum of Natural History at Virginia Tech, Blacksburg), and larvae were observed damaging the foliage and stems of several plants. Other plant species characteristic of the habitat were fragrant sumac *(Rhus aromatica* Ait., Anacardiaceae) and New Jersey tea *(Ceanothus americanus,* Rhamnaceae).

During 15–16 May 1993, I returned to the Montgomery Co. site for further observations and attempted to make additional collections of the beetle in nearby areas of southwestern Virginia. Larvae were still present on fire pink along Seneca Hollow Road, and they had severely damaged the basal leaves of several plants; no adults were seen. The characteristic larval injury, which can be considered almost diagnostic for this insect, was observed on fire pink on a shaly slope along Flatwoods Road (Rt. 713) northeast of Ironto, and nearby on white campion growing along the railroad on North Fork Road (Rt. 603). Possible adult feeding was observed in the Ironto area on a few leaves of the legumes yellow sweet clover *(Melilotus officinalis* [L.] Pallas) and red clover *(Trifolium pratense* L.). No beetles or their injury were found on fire pink on Brush Mountain in Montgomery County or on Bald Knob in Franklin County. Surveys for the coccinellid on potential leguminous and caryophyllaceous hosts were likewise negative along railroads and roadsides at about 10 other sites in Giles, Montgomery, Pulaski, and Roanoke counties.

I later collected the European alfalfa beetle in west-central Virginia (Nelson Co.). On 28 May 1993, larvae were found on fire pink along the Blue Ridge Parkway near milepost 1 southeast of Waynesboro. Injury was apparent on about 10 plants on a dry bank at the edge of woods. Voucher specimens of larvae have been deposited in the insect collections at Cornell University, Ithaca, New York.

Discussion

The record for Montgomery County, Virginia, extends the range of the European alfalfa beetle about 241 km (150 miles) south of Grafton, West Virginia (see Gordon, 1976 for previous records), and becomes the southernmost U.S. locality known for this adventive species. Populations in the state may be quite limited, occurring mainly along railroads, but extensive surveys are needed to delimit the extent of its current range. If evidence for the beetle's recent arrival with European commerce were not clear-cut, its collection in relatively natural areas—along the Blue Ridge Parkway in Nelson Co. and in Maryland's Green Ridge State Forest in Allegany Co. (23 May 1993)—would suggest an indigenous status in our fauna.

Silene virginica is only the second native plant known to serve as one of the beetle's hosts in the New World. The coccinellid could be considered a beneficial introduction when it damages colonies of the naturalized weed *Saponaria officinalis,* but undesirable when it attacks an attractive wild flower such as fire pink.

In North America, the European alfalfa beetle is not known to have used alfalfa or other legumes as larval hosts (Wheeler & Henry, 1981), but a change in food habits remains possible. Although the coccinellid is polyphagous, using hosts in 12 families (USDA, 1974), European populations often show extreme host specificity. The possibility of a sibling species complex or subspeciation has been suggested, or the beetle could be polymorphic in host preference as well as in elytral color pattern (Tanasijević, 1958; Richards et al., 1976; Wheeler & Henry, 1981). The European alfalfa beetle's continued spread in North America should be monitored, but resolution of some fundamental questions regarding its taxonomic status and ecology is also needed.

Acknowledgments

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Richmond) for accompanying me in the field, E. R. Hoebeke (Department of Entomology, Cornell University, Ithaca, NY) for helpful comments on the manuscript, and R. L. Hoffman (Virginia Museum of Natural History, Martinsville) and T. F. Wieboldt (Massey Herbarium, VPI & SU, Blacksburg) for helping me locate colonies of fire pink.

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Virginia Record for an Introduced Palearctic Stilt Bug, *Berytinus minor* (Heteroptera: Berytidae)

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During the six-week trapping interval of 31 March - 11 May, 1992, a drift fence unit operated by VMNH obtained the first known Virginia specimen of the stilt bug *Berytinus minor* (Herrich-Schäffer). This installation was located at 1190 m ASL on "The Priest", 6.4 km southeast of Montebello in western Nelson County.

Berytinus minor is a common and widespread insect in much of western Europe. The history of its establishment and subsequent spread in North America has been carefully chronicled by A. G. Wheeler (1970, 1979), who suspected that the bug was brought to this continent by passive transport in plant material. The earliest documented specimen was taken in Ontario in 1929, and after a lag period of two decades the species was being found at many places in New York, New England, and eastern Canada. Wheeler (1970) provided a spot map of the capture sites known to him, indicating southward spread into northern parts of Ohio and New Jersey. Evidence at the time suggested that dispersal was being accomplished by both "natural" and anthropochoric means.

In his supplementary note about this species, Wheeler (1979) recorded his capture of specimens at the Cranberry Glades, Pocahontas Co., West Virginia, extending the known range some 320 km further southward. This region is well-known as a disjunct postglacial refugium for many kinds of plants and animals, so the discovery of *minor* there might suggest natural occurrence except

that Wheeler himself captured the material by beating *Picea glauca*, an exotic ornamental evergreen planted in landscaping around the Visitor Center. For this reason he inclined to the commercial transport of plant materials as the more likely explanation for the burgeoning area colonized by *B. minor* in a relatively short time.

The discovery of the species on "The Priest" extends the range of *minor* only a rather inconsequential 110 km (70 miles) east-southeast of the Cranberry Glades. Although the addition of another component to the known fauna of a region is of some intrinsic interest, the most notable feature about the capture site on "The Priest" is its essentially undisturbed facies. It would be difficult to imagine anyplace in Virginia more removed from the influence of agrarian or horticultural activities. Although the bug's host plant, *Trifolium repens*, occurs everywhere in Virginia, the nearest farms or even summer homes are separated from the pitfall site by five or six km of continuous deciduous forest and about 300 m of vertical relief. In this case the possibility of chance introduction by human activities seems implausible. Until more is learned about the presence of *Berytinus minor* in Virginia, speculation about the source of the "Priest" population seems futile.

Berytinus is easily distinguished from the other two local genera of the family (*Neides* and *Jalysus*) by the apically clavate 1st antennomere and the short hind legs, the femora of which do not extend back to abdominal apex. Local entomologists might profitably capitalize on Dr. Wheeler's findings in New York, and search for this recent immigrant into Virginia on and under white clover. Dispersal seems most pronounced in April in New York; our milder and shorter winters might suggest even earlier movements in Virginia.

Acknowledgment

Dr. A. G. Wheeler, Jr. (Pennsylvania Department of Agriculture) has been so kind as to provide information, encouragement, and a review of the foregoing note in an early phase.

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Miscellanea

The Origin of *Banisteria* and the Virginia Natural History Society

The Virginia Natural History Society and its journal *Banisteria* had its roots in discussions of the role of natural history in academic institutions. A trend that developed in the 1980s in Virginia colleges and universities, indeed in many such institutions in the United States, was away from organismal biology and toward those disciplines which examined molecular and cellular processes. Two attitudes on the part of administrators and some biologists seemed prevalent: (1) that the study of the parts of an organism was more important than the study of the whole organism and the context in which it lives, and (2) that the use of high-tech instruments in the laboratory was more alluring to students than field biology. Many with whom I talked lamented the continual loss of organismal courses, such as mammalogy, herpetology, and those in other disciplines. Such courses taught by older faculty were, and continue to be, dropped when these professors retired.

In addition, the increasing emphasis on university researchers having to successfully acquire grants with overhead funds in order to receive promotion and tenure placed additional significance on laboratory and high-tech studies. Grants for high-tech research frequently have overhead costs included, whereas only infrequently are overhead costs part of field-oriented grants. Further, overhead is seldom a part of grants in the growing field of conservation biology. Hence, my concerns were fueled by the change in focus in institutions of higher learning and the attitudes on the part of an increasing number of administrators and academic scientists that the study of natural history was old fashioned and "unscientific."

Journals that once devoted space to natural history have increasingly turned down such contributions, one, because of the attitudes about what constitutes scientific advancement and two, because of the high costs of publication. The number of workers in many disciplines has increased and journal space is more and more devoted to papers addressing broad questions. There are few publications available for natural history manuscripts. Many of my colleagues have become increasingly concerned that natural history data and observations useful to land managers and conservation biologists have become increasingly difficult to publish. But the only permanent way for information to be accessible to those needing it is via publications.

The *Virginia Journal of Science* has been, in general, an exception to the above attitudes and restrictions. However, this journal has historically published the results of specific studies and the occasional natural history observation. With the exception of several natural history-oriented symposia published between 1987 and 1991, the emphasis seemed to be placed on papers and symposia dealing with subjects other than natural history and organismal biology. I found it frustrating to have to wade through papers on unrelated subjects in order to find papers on natural history topics. A forum in which to interact with other people interested in natural history for its own sake was also lacking.

Finally, I had experienced a number of instances where useful natural history data and observations were in danger of being lost forever had I not salvaged them. There are many useful records and data in the drawers and files of scientists and laypersons that will never be available to people who would find them useful unless there is a means of bringing them out. I envisioned a mechanism that would make hidden but useful information permanently available to the rest of us and to history. And, I envisioned a means by which natural history papers would not have to compete for publication space.

Discussions over 1987–1991 with other biologists sharing similar concerns, particularly R. L. Hoffman, C. B. Knisley and T. F. Wieboldt, and several lay persons interested in natural history, led me to conceive of a state-level journal that would serve as an outlet for a wide range of natural history observations derived from research conducted in Virginia. In 1991, I asked Richard L. Hoffman to join me on this project. It was he who suggested the name *Banisteria* for the journal.

We subsequently asked colleagues whether they would contribute papers to such a journal. The reception was encouraging and at the 1991 meetings of the Virginia Academy of Science at VPI&SU, we passed out the first announcement and solicited financial contributions. The results confirmed our original perception, as 14 people and a local chapter of a national professional society contributed money directly to me to help start *Banisteria*. The society was only an idea at the time. Several colleagues subsequently contributed manuscripts and R. L. Hoffman and I wrote or helped to write several others. Each manuscript was reviewed by at least one colleague other than Hoffman and me. The first issue of *Banisteria* was finally published on 13 November 1992 with the help of Rick Boland of the Virginia Museum of

Natural History. It contained 10 papers dealing with various aspects of the natural history of the Commonwealth.

The Virginia Natural History Society (VNHS) was established after the seminal publication of *Banisteria*. It had quickly become apparent that we needed an umbrella organization. Several of our colleagues became enthusiastic about a society devoted to natural history and saw the value in offering a forum to both academic natural historians and lay persons. Thus, Michael Kosztarab agreed to be the society's first President, Barry Knisley the first Vice-President, and Anne Lund the Secretary/Treasurer. These officers have taken the initiative and have formed a solid foundation for the future development of the VNHS.

The first public organizational meeting of the VNHS was on 20 May 1993 at the annual meeting of the Virginia Academy of Science in Norfolk. It was there we ratified the Constitution, officially elected the officers (as noted above, plus three Councilors), and inaugurated the Virginia Natural History Society.

Joseph C. Mitchell
Department of Biology
University of Richmond
Richmond, VA 23173

Message from the President

This is my first chance to greet all members of The Virginia Natural History Society before the closing of the first successful year. We have made excellent progress.

Anne C. Lund, our Secretary-Treasurer, reported that our fiscal affairs are in order and that the membership is around 130 at present. Thanks to the diligent work of our two editors, Joseph C. Mitchell and Richard L. Hoffman, and the enthusiastic support from members, the first issue of *Banisteria* was well-received. A number of institutions have already subscribed to it. The second issue will be even broader in coverage of topics than the first one and longer. We are also including in this issue some space devoted to Society business. All of these cost the Society extra money, thus the reason to increase yearly dues and subscription rates. These changes were approved by the Executive Committee during out meeting of May 1, 1993.

The enclosed Articles of Incorporation and Bylaws of the Society, prepared by C. Barry Knisley, were adopted at our Norfolk meeting on May 20, 1993. As you may have noticed, we expanded our membership categories. Also, the Executive Committee was enlarged with the addition of three Councilors. They include Richard J. Neves, Thomas J. Rawinski, and Carolyn Wells.

On August 5, we organized a successful field trip to some mountain tops in southwestern Virginia, concentrating on grass-feeding small invertebrates. These were just a few of the many activities of the Society this past year, and we hope to expand further our activities next year. Your suggestions will be appreciated.

The members of the Executive Committee join me in expressing our thanks for your support. We are all looking forward to another successful year.

Michael Kosztarab
President, VNHS

Announcements

1. The First Annual Meeting of the Virginia Natural History Society will be held on 19-20 May 1994 at James Madison University, Harrisonburg, VA in conjunction with the Virginia Academy of Science. The VNHS will organize a new section entitled "Biodiversity and Natural History."

Members and others wishing to present papers in this section should send their titles (only) to the Section Secretary (and VNHS Vice-President) Dr. C. Barry Knisley, Dept. of Biology, Randolph-Macon College, Ashland, VA 23005 by 1 February 1994. Additional information about the meeting may be obtained from the Virginia Academy of Science, Dept. of Biology, University of Richmond, VA 23173.

2. The Virginia State Library and Archives will present "All the Ornaments of Nature," a chronological journey through its collections of visual and literary observations of Virginia's flora and fauna. The exhibition will feature writings and illustrations of about forty 16th to 20th century artists and natural scientists, including John Banister, Mark Catesby, John Clayton, and John J. Audubon. The exhibition will run from 12 October to 20 December 1993. Additional information may be obtained by calling Janice Hathcock (804-786-7133) or Suzanne Arnold (804-786-2311), or by writing the Virginia State Library and Archives, 11th Street at Capitol Square, Richmond, VA 23219-3491.

THE VIRGINIA NATURAL HISTORY SOCIETY
ARTICLES OF INCORPORATION AND BYLAWS

ARTICLES OF INCORPORATION

Article I. NAME

The society shall be called "The Virginia Natural History Society" (referred hereinafter as "the Society").

Article II. OBJECTIVE

The objective of the Society shall be to promote the study of all aspects of Natural History of Virginia to educate the citizens of the Commonwealth about natural history and to conserve its natural resources.

Article III. The Society shall formulate bylaws to regulate its organization and procedures.

Article IV. The governing body of the Society shall be the Executive Committee.

Article V. The Society is organized for scientific, educational, and charitable purposes as defined under the appropriate sections of the Internal Revenue Code. The Executive Committee is empowered to make appropriate changes to retain the tax-exempt status of the Society. Any such changes require a majority vote of the Executive Committee.

BYLAWS

Article I. MEMBERSHIP

Section 1. Anyone who is interested in the objective of the Society is eligible for membership. Membership can be attained by application to the Secretary-Treasurer.

Section 2. The classes of membership shall be Regular, Student, Family, Institutional, Supporting, Patron, Benefactor, Life and Honorary. Annual dues for these classes of membership are:

Regular - $15.00
Student - $5.00
Family - $20.00
Institutional - $30.00
Supporting - $50.00
Patron - $100.00
Benefactor - $300.00
Life - $500.00 (not annual)
Honorary - $0.00

Section 3. Honorary members shall be nominated by the Executive Committee and voted upon at the General Business Meeting. Additional nominations may be made from the floor. Honorary Members shall be elected by a simple majority vote of those Members present at the General Business meeting. Honorary Members shall be recognized leaders in the field of Virginia natural history. No more than 10 Honorary Members shall exist at any time. Honorary Members shall be entitled to vote and shall be eligible to hold office in the Society. Student members must be currently enrolled as graduate, undergraduate or high school students. A letter from their school authorizing their student status must be included with the application for membership.

Section 4. To be a Member in good standing a person must not be in arrears for dues. All annual dues for each ensuing year shall be due 1 January. Publications of the Society will be sent only to Members in good standing and to subscribing Institutions.

Article II. OFFICERS AND COMMITTEES

Section 1. The officers of the Society shall be a President, a Vice-President (President Elect), a Secretary-Treasurer, two Co-Editors, and three Councilors.

Section 2. The President shall be the chairman of the Executive Committee and presiding officer at meetings of the Society, and appoint the Standing Committees of the Society and any other committees deemed necessary. The President casts only tie-breaking votes. The President shall serve a 2-year term beginning January 1st and ending December 31st, but will usually not serve for two consecutive terms. The President shall be responsible to the Executive Committee to whom an annual report shall be made.

Section 3. The Vice-President shall be the President-Elect, shall be elected by a plurality of ballots cast by the Society's membership, and shall succeed to the Presidency in the event the office becomes vacant. The Vice-President shall be chairman of the Membership Committee, shall be responsible for coordinating with the local chairman arrangements for the scientific meetings of the Society, and shall preside over all meetings in the absence of the President. The Vice-President shall be responsible to the Executive Committee to whom an annual report shall be made.

Section 4. The Secretary-Treasurer shall be elected by a plurality of the ballots cast by the Society's membership for a 4-year term. The Secretary-Treasurer shall record all the proceedings of the Society, supervise all official mailings except the Society's publications, respond to all inquiries pertaining to membership, subscription, and society matters and maintain the membership and subscription lists. The Secretary-Treasurer shall be responsible to the Executive Committee to whom an annual report shall be made. The Secretary-Treasurer shall prepare and distribute an agenda for the Executive Committee and compose a summary of the Committee and General Business Meetings.

The Secretary-Treasurer shall be in charge of all funds, keep the financial records of the Society, and be responsible for an independent yearly audit. The Secretary-Treasurer shall summarize the annual audit and submit it for publication in Banisteria.

Section 5. The Co-Editors shall be appointed to a 2-year term of office by a majority vote of the Executive Committee. The Co-Editors shall be responsible for preparation of the semiannual journal Banisteria, and for maintaining high scholarly standards in its content. The Co-Editors shall be responsible to the Executive Committee to whom an annual report shall be made.

Section 6. The Executive Committee shall be the governing body and shall consist of the Executive Council in addition to the President, the Vice-President, the Secretary-Treasurer, the 2 Co-Editors, and the last three Presidents. The Executive Council shall consist of three Councilors. Three Members in good standing who do not then hold other Society offices shall be elected, one in each of three consecutive biennia, with staggered terms by a plurality of the ballots cast by the Society's membership to serve 4-year terms as councilors. Councilors shall be eligible for reelection 2 years after the expiration of their previous terms.

Section 7. A quorum of the Executive Committee shall consist of one more than half of its Members and must include the President or Vice-President. Decisions shall be made by simple majority of those Members present.

Section 8. Vacancies in the staff of officers shall be filled by appointments approved by the majority of the remaining Members of the Executive Committee, except in the case of presidential vacancy (see Article II, Section 3). An appointee shall hold office only for the remainder of the term of his or her predecessor. Interim appointments of officers shall not constitute elected tenure.

Section 9. The Annual Meeting Committee is a standing Committee and shall be appointed by the President.

Article III. MEETINGS

Section 1. The Society shall sponsor such Scientific Meetings as it deems advisable. The objectives of the Society's meetings shall be to present appropriate scientific papers and to foster the exchange of ideas among persons interested in Virginia natural history.

Section 2. There shall be an annual General Meeting held sometime during a Scientific Meeting. Notice of this meeting shall be made with the

notice of the Scientific Meeting (see Section 6 below). Those present shall constitute a quorum.

Section 3. The Executive Committee shall meet at some time during each meeting of the Society and at other times if deemed necessary by the President. As occasion demands, the Secretary, at the direction of the President, may submit matters to the Executive Committee for vote by mail ballot. All such votes of the Executive Committee shall be placed on record and submitted for ratification at the next meeting of the Executive Committee.

Section 4. The Vice-President shall recommend the time and place of annual Scientific Meetings. The Executive Committee shall give final approval to such recommendations.

Section 5. The Annual Meeting Committee shall prepare the program for the annual meeting and solicit and schedule paper presentations.

Section 6. Notice of the annual Scientific Meeting shall be published in Banisteria, when possible.

Section 7. All Meetings, except Scientific Meetings, shall be conducted under Robert's Rules of Order.

Article IV. ELECTIONS

Section 1. The President, Vice-President, Secretary-Treasurer, and Councilors shall be elected by mail ballot from a list of nominees assembled by the Nomination Committee, presented to the Executive Committee for approval and to the members present at the General Business Meeting. Additional nominations shall be supported in writing by five or more members and presented at the General Business Meeting, or sent to the Secretary anytime before or within 3 weeks after the adjournment of the General Business Meeting. Willingness of nominees to serve shall be secured in writing before their names are placed on the ballot.

Section 2. Ballots shall present a choice of at least two candidates for each of the offices of President-Elect, Secretary-Treasurer and Councilor.

Section 3. A ballot shall be mailed by the Secretary-Treasurer to all members by October 1st of the second year of the biennium. Ballots returned to the Secretary-Treasurer on or before November 30th of the same year shall be tabulated and recorded by a three-member ad-hoc Ballot Committee which includes the Secretary-Treasurer.

Section 4. The President shall notify the candidates for office of the election results and an announcement of the election results shall be published in the first issue of Banisteria the year following.

Section 5. A tie vote for any office shall be resolved by a secret ballot of the Executive Committee.

Article V. FINANCES

Section 1. All funds received by the Society shall be used for publication of all official publications of the Society, and to defray other expenses incurred in the conduct of Society business as determined and approved by the Executive Committee. Society Business includes but is not limited to the following:

a. Publication of Banisteria
b. Publication of meeting programs.
c. Rental fees for meeting rooms.
d. Registration fees and provision of advanced monies for purposes of sci-entific meetings.
e. Annual audit.
f. Postage and duplicating costs for ballots, reports for the Executive Meeting, and other official mailings of the Society.

Section 2. No part of the net earnings of this Society shall ever inure to, or for the benefit of, or be distributable to its members, trustees, officers, or other private persons, except that the Society shall be empowered to pay reasonable compensation for services rendered, and to make payments and distributions in furtherance of the exempt purposes for which it was formed.

Section 3. A yearly audit of Society finances shall be made, as provided in Article II, Section 4.

Section 4. In the event that the Society shall cease to exist, after paying or adequately providing for the debts and obligations of the association, the remaining assets shall be distributed to a non-profit fund, foundation, or corporation, which is organized and operated exclusively for scientific, educational, and/or charitable purposes and which has established its tax exempt status under the appropriate Section of the Internal Revenue Code. The specific non-profit organization or organizations to receive any remaining funds may be determined and approved by the Executive Committee.

Article VI. PUBLICATIONS

The Society shall publish such scientific publications as authorized by the Executive Committee. Membership shall be a prerequisite for publication.

Article VII. DUES

Annual dues shall be determined by the Executive Committee and shall be due before the first day of each year.

Article VIII. FISCAL YEAR

The fiscal year of the Society shall coincide with the calendar year.

Article IX. AMENDMENTS TO THE ARTICLES OF INCORPORATION

Section 1. Proposed amendments to the Articles of Incorporation may be originated by the Executive Committee or by a written request addressed to the Secretary and signed by at least 10 Members or by a simple majority of Members in good standing present at a General Business Meeting of the Society.

Section 2. Voting on proposed amendments shall be by mail. The Secretary-Treasurer shall mail copies of proposed amendments and ballots to all members of the Society and shall allow one month for their return, the due date being stated on the ballot. An affirmative vote by two-thirds of the ballots cast by the Society's membership shall be necessary for adoption of an amendment to the Articles of Incorporation. Each proposed amendment shall be accompanied by a concise statement of its purpose, and comparison with the existing provisions, if any.

Section 3. The Secretary-Treasurer shall count and record the vote on an amendment and shall immediately notify the Executive Committee of the result. The result of the voting shall be announced to the membership of the Society in the next official issue of the journal.

Article X. AMENDMENTS TO THE BYLAWS

Bylaws for the conduct of the business of the Society may be enacted, amended, or repealed by a simple majority vote of the Executive Committee.

Chrysogonum virginianum Linnaeus

Original drawing by John Banister. Figure 83 in folio in Hans Sloane's MS 4002 in the British Museum. Photocopy courtesy of Joseph and Nesta Ewan.